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January 30, 2002

Ms. Magalie Salas, Secretary
Federal Communications Commission
445 12th Street SW
Washington DC 20554

Re: ET Docket No. 98-153 -- Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems
Ex Parte Communication

Dear Ms. Salas:

Pursuant to Section 1.1206(a)(1) of the Commission's Rules, on behalf of XtremeSpectrum, Inc., I am electronically filing this written ex parte communication in the above-referenced proceeding.[1]

Attached is a copy of XtremeSpectrum's recent presentation to NTIA, as provided earlier today to Julius P. Knapp, Michael Marcus, Karen E. Rackley, and John A. Reed of the Office of Engineering and Technology.

Most of this information has been in the docket for several weeks or more. This presentation consolidates, reorganizes, and (in some instances) condenses that information, and also responds to a few issues that have arisen since the earlier submissions.

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[1] XtremeSpectrum, with 67 employees, conducts research in ultra-wideband communications systems as its sole business. XtremeSpectrum intends to become a ultra-wideband communications manufacturer once the Commission authorizes certification of such systems. XtremeSpectrum takes no position on ultra-wideband radar applications.

If there are questions about this filing, please call me at the number above.

Respectfully submitted,

Mitchell Lazarus
Counsel for XtremeSpectrum, Inc.

cc: Chairman Michael Powell
Commissioner Kathleen Q. Abernathy
Commissioner Michael J. Copps
Commissioner Kevin J. Martin
Edmund J. Thomas, Chief (Designated), OET
Bruce Franca, Acting Chief, OET
Lisa Gaisford, Chief of Staff, OET
Karen E. Rackley, Chief, Technical Rules Branch, OET
John A. Reed, Senior Engineer, Technical Rules Branch, OET
Julius P. Knapp, Deputy Chief, OET
Michael Marcus, Associate Chief of Technology, OET

XtremeSpectrum

XtremeSpectrum

Analysis of XtremeSpectrum Proposal of November 2001 and Federal Systems Including GPS

All Federal Criteria Are Satisfied

This Presentation Will Show

XtremeSpectrum

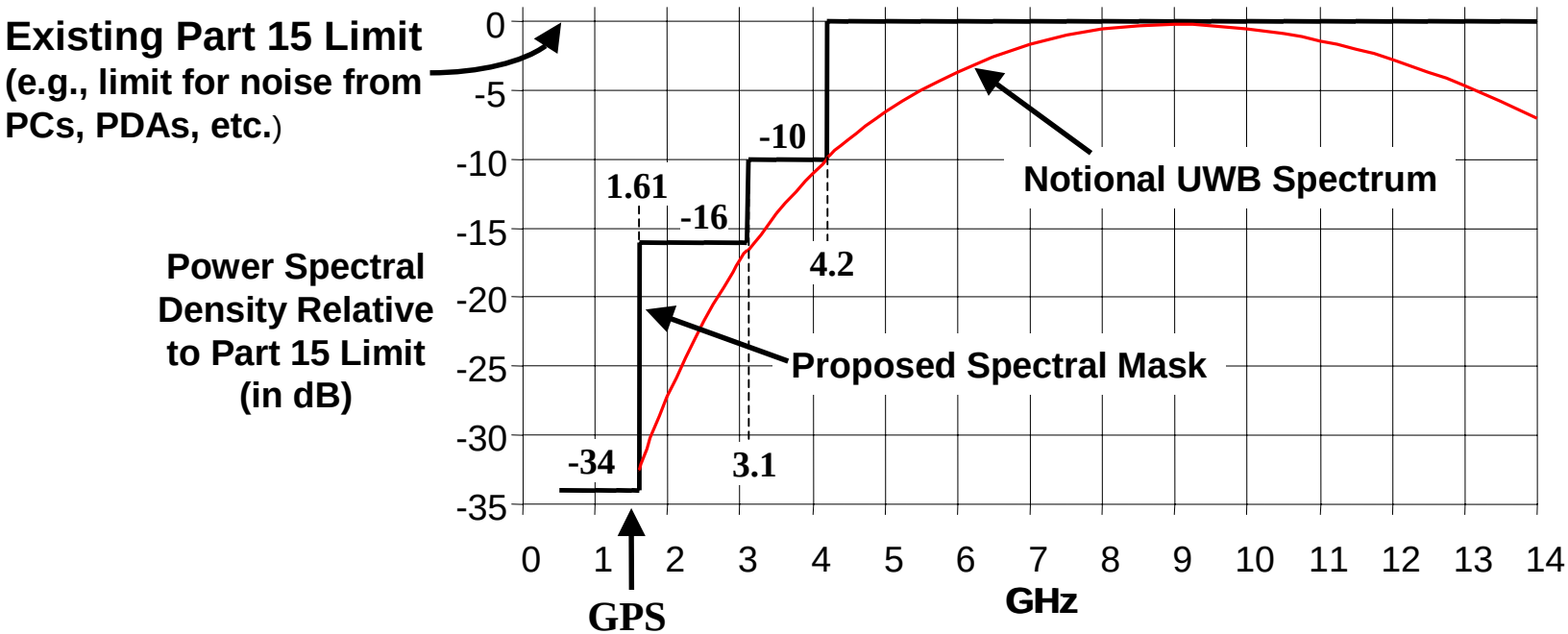
- **All Federal criteria for all Federal systems are satisfied**
  - By XtremeSpectrum proposal for Peer-to-Peer operation
  - Submitted to FCC November 2001 (Option “b” of that filing)
  - XtremeSpectrum presented to IRAC November 2001
- **Safety criteria & methods used are from US govt. reports**
  - Submitted to FCC docket 98-153 during the 3+ years of the proceeding
  - Methodology is test of proposed rules against the government criteria
- **The XtremeSpectrum proposal is safe for GPS in all scenarios**
- **No new technical information or techniques are contained or used in this analysis and presentation**

XtremeSpectrum Proposal

- **No outdoor infrastructure for UWB**
  - No mast or pole mounts, no fixed outdoor infrastructure
- **Give manufacturers a choice of compliance options**
  - Indoors - Operation at modified NPRM levels (-12 dB from Class-B below 2 GHz, -21 dB from Class-B in GPS band), or
  - Peer-to-peer operation at greatly reduced emissions levels (see below) and only when affirmatively initiated by the user (no automatic peer-to-peer operation)
- **For peer-to-peer operation**
  - We suggest the following emissions limits which are considerably more stringent than the FCC's NPRM proposal:
  - 960-1610 MHz 34dB below Sec. 15.209(a) levels
  - 1610-3100 MHz 16dB below Sec. 15.209(a) levels
  - 3100-4200 MHz 10dB below Sec. 15.209(a) levels
  - Above 4200 MHz Section 15.209(a) levels

  - *While the record does not justify limits tighter than Sec. 15.209(a) values in the 3100-4200 MHz band, XtremeSpectrum will accept this limit if necessary to resolve a ban on peer-to-peer*

Limit UWB in Sensitive Bands



- **Limit UWB to levels far below those proposed in the NPRM**
- **Limit UWB in GPS bands to levels requested by GPSIC, exceeds RTCA and all other GPS advocates in ALL other FCC proceedings**

While the record does not justify limits tighter than Sec. 15.209(a) values in the 3100-4200 MHz band, XtremeSpectrum will accept this limit if necessary to resolve a ban on peer-to-peer

XtremeSpectrum Analysis Methodology

- **The NTIA reports established a valuable analysis benchmark**
- **XtremeSpectrum used the NTIA reports to analyze its proposal**
  - XS UWB levels and NTIA methodologies
- **Considered scenario geometry and RF safety for big radars**

Industry Recommendations for RF Safety Near Big Radars

XtremeSpectrum

- **Radars are not directed (sited) to pose an RF hazard to the public**
  - This should be considered when selecting interference scenario geometries
- **Key test standards for RF radiation safety (e.g. around big radars)**
  - General Electronics Devices, 3V/m (Computers, calculators, GPS …)
    - IEC 61000-4-3 general EMC test
  - Critical Medical Electronic Devices, **10 V/m** (pacemakers, insulin pumps …)
    - IEC 60601-1-2 (**FDA recommendation – 10V/m)**
  - Automobiles, **50 V/m** (automatic braking systems, electronic ignition, etc.)
    - SAE J1113 – part 8 - also 20 V/m part 9
  - Aircraft, **100 V/m**
    - FAA Notice N8110.71 – for fixed wing aircraft
  - Fuels, **3.1 kV/m**
    - DNA 4284-F-SAS-1
- **Part 15 UWB levels are never larger than 500 uV/m at 3 m**

Margins Between NTIA 01-43 and XtremeSpectrum Proposal

System		NTIA Acceptable dBm/MHz		XSI Mask dBm/MHz	dB Below Class B	Ave Bldg Loss (dB)	dB Margin of XS Proposal relative to NTIA Protection Criteria	
	GHz	2m	30m				2m Case In/Out	30m Case In/Out
DME, Interrogator	0.960-1.215	-47	NA	-75	34	9	37/28	-
DME, Transponder	1.025-1.150	-64	-57	-75	34	9	20/11	27/18
ATCRBS, Transponder	1.030	-44	NA	-75	34	9	40/31	-
ATCRBS, Interrogator	1.090	-31	-45	-75	34	9	53/44	39/30
ARSR-4	1.240-1.370	-61	-80	-75	34	9	23/14	0/-5
SARSAT	1.544-1.545	-69	-66	-75	34	9	15/6	18/9
ASR-9	2.7-2.9	-46	-66	-57	16	9	18/9	0/-9
NEXRAD	2.7-2.9	-42	-76	-57	16	9	24/15	-10/-19
Marine Radar	2.9-3.1	-56	-57	-57	16	12	13/1	12/0
CW Altimeters	4.2-4.4	25	NA	-41.3	0	12	78/66	-
Pulsed Altimeter	4.2-4.4	14	NA	-41.3	0	12	67/55	-
MLS	5.030-5.091	-54	NA	-41.3	0	12	-	-
TDWR	5.60-5.65	-35	-63	-41.3	0	12	18/6	-10/-22

Non-GPS Radar & Navigation Systems From NTIA Reports

XtremeSpectrum

- **Radio Navigation Systems**
  - DME, ATCRBS, Altimeters
- **Weather Radar**
  - TDWR, NEXRAD
- **Air Surveillance Radar**
  - ARSR-4, ASR-9
- **Maritime Radar**
- **Search and Rescue Satellites**
  - SARSAT

Distance Measuring Equipment (DME) NTIA Criteria Satisfied

XtremeSpectrum

- **Distance Measuring Equipment (DME)**
  - Measures range from aircraft's interrogator to ground transponder
  - Operates at 960-1215MHz
- **NTIA SP 01-43 indicates no issues with XS proposal of –34dB**
  - DME protection criteria from NTIA 01-43 Table 4-25, 4-26
- **DME NTIA protection criteria is satisfied**
  - Even with main beam to main beam coupling. Margin for indoor not needed

	NTIA 01-43 Margin from Class B UWB (separation)	XS Proposed –34 dB UWB (separation)	–34 dB UWB and 9 dB building isolation (separation)
DME Interrogator	-6.0 dB (90 m)	+28 dB (0 m)	+37 dB (0 m)
DME Transponder (UWB 2 m high)	-22.9 dB (290 m)	+11.1 dB (0 m)	+20.1 dB (0 m)
DME Transponder (UWB 30 m high)	-16.0 dB (290 m)	+18 dB (0 m)	+27 dB (0 m)

Air Traffic Control Radio Beacon System (ATCRBS)—Criteria Satisfied

- **Air Traffic Control Radio Beacon (ATCRBS)**
  - Aircraft transmits an identifier in response to interrogation
  - Operates at 1030 & 1090 MHz
- **NTIA SP 01-43 indicates no issues with XS proposal of –34dB**
  - ATCRBS protection criteria from NTIA 01-34 Table 4-17 and 4-18
- **ATCRBS NTIA protection criteria is satisfied**
  - Even with main beam to main beam coupling. Margin for indoor not needed

	NTIA 01-43 Margin from Class B UWB (separation)	XS Proposed –34 dB UWB (separation)	–34 dB UWB and 9 dB building isolation (separation)
ATCRBS Transponder	-3.1 dB (20 m)	+30.7 dB (0 m)	+39.7dB (0 m)
Interrogator (2 m)	+10.8 dB (0 m)	+44.8 dB (0 m)	+53.8 dB (0 m)
Interrogator (30 m)	-5.6 dB (270 m)	+28.4 dB (0 m)	+37.4 dB (0 m)

Pulsed and CW Radio Altimeters NTIA Criteria Satisfied

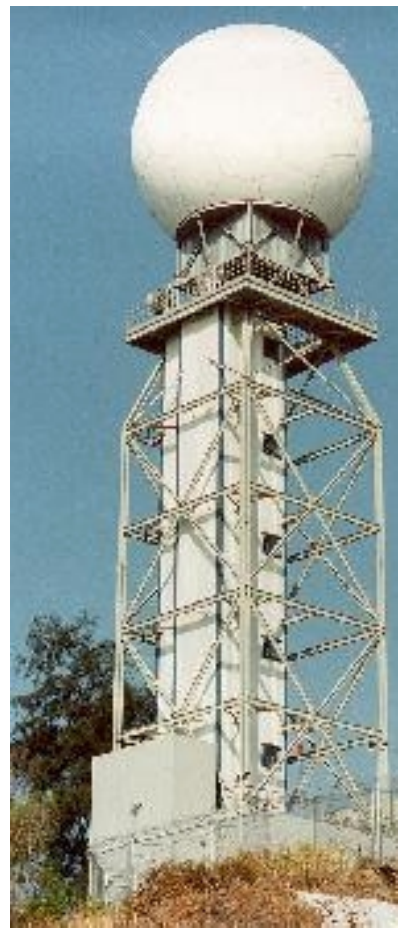
XtremeSpectrum

- **NTIA SP 01-43 shows 55-66 dB of margin from ground based UWB devices—indicates no issues with XS proposal**
  - No margin for building losses applied
- **Pulsed and CW radio altimeter protection requirements satisfied**
  - Assumes free-space propagation & main beam to main beam coupling
  - Protection requirements from NTIA SP 01-43 Table 4-16, Table A-4

Terminal Doppler Weather Radar (TDWR)—What It Is

XtremeSpectrum

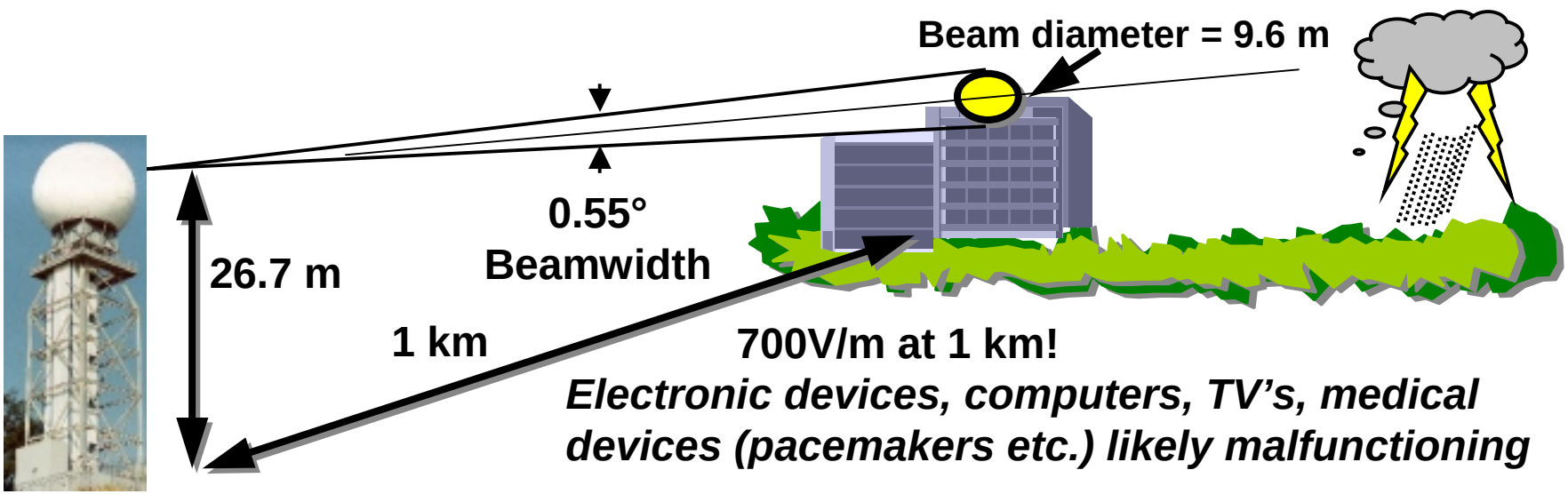
- **Detect wind shear & other weather hazards at airports**
- **TDWR is powerful—radiating 15 Billion Watts EIRP!**
- **Specifications are**
  - 5.6 GHz
  - 150 kW peak
  - 50 dB gain Antenna (0.55° spot beam)
  - Noise floor -110 dBm / 910 kHz bandwidth
  - It is circularly polarized -- 3 dB coupling loss to UWB signals
- **Siting is critical**
  - Buildings and terrain must not block coverage over the runways
  - Must be 8-10 km from runway to meet aircraft RF safety limits
  - Safety requires it to be far from people or blanked if too close



TDWR
Issue Identification

XtremeSpectrum

- **NTIA SP 01-43 indicates no issues for 2m high UWB at Class B**
  - NTIA SP 01-43 Figure 4-23
  - No margin for building losses applied
- **NTIA SP 01-43 indicates a potential issue for 30m high UWB**
  - Scenario geometry below (solution next page)



TDWR
Issue Resolution

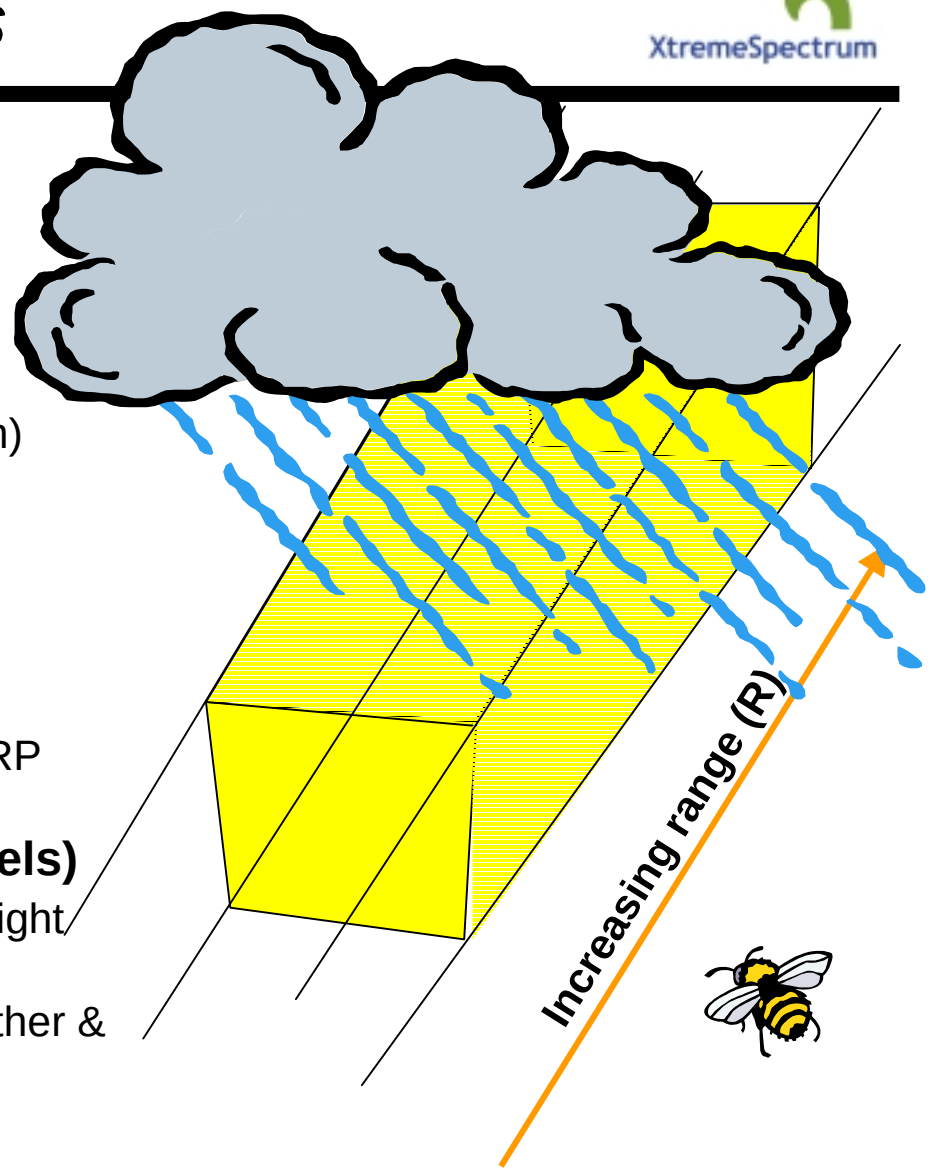
XtremeSpectrum

- **Worst case scenario is outdoor 30m UWB 400m from the TDWR**
  - NTIA SP 01-43 Figure 4-24 indicates 22dB additional isolation required
- **In order for the UWB device to be at 30m it must be in a building**
  - Mast & pole mounting are prohibited by the XtremeSpectrum proposal
- **TDWR is a spot beam radar and is therefore blocked by the building**
- **Must blank or elevate the radar to operate (UWB not a factor)**
  - Clearing 30m building at 400m needs 1.25º degrees elevation (9m) for 22dB
- **If the TDWR is not blanked or elevated the building is subject to excessive RF fields**
  - Fields would exceed 800V/m
  - Exceeds safety standards for automobiles, airplanes, electronic devices, medical devices etc.

Next Generation Weather Radar (NEXRAD)—What It Is

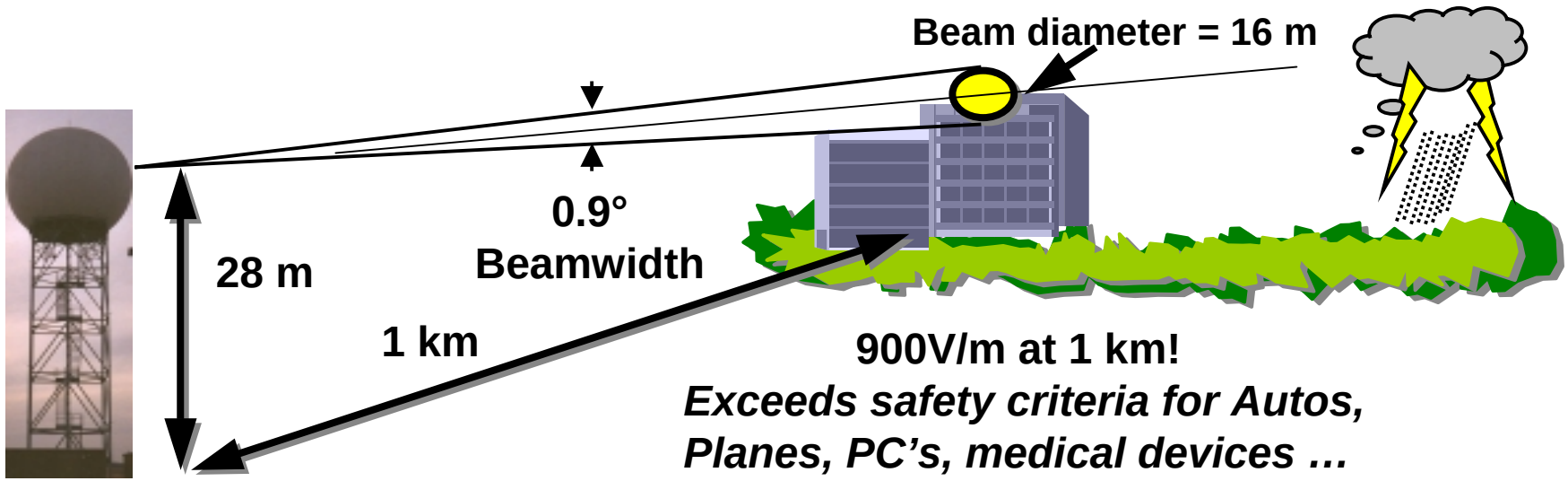
XtremeSpectrum

- **Detect hazardous & routine weather**
- **Specifications**
  - 2.7-3.0 GHz
  - 750 KW peak, 300-1300 W Average
  - 45.5 dB gain Antenna (.925° spot beam)
  - -113 dBm/500KHz noise floor
  - It is circularly polarized and has a 3 dB coupling loss to UWB signals
- **NEXRAD is extremely powerful**
  - 26.6 GW peak and 46 MW average EIRP
- **Weather radars sense volumes (voxels)**
  - Voxels grow with range since the flashlight beam radiated spreads with distance.
  - Because of this weather radars see farther & with better SNR than other radars



NEXRAD
Issue Identification

- **NTIA SP 01-43 indicates no issues for 2m high UWB at Class B**
  - NTIA SP 01-43 Figure 4-3. No building losses applied
- **NTIA SP 01-43 indicates a potential issue for 30m high UWB**
  - Scenario geometry below (solution next page)



NEXRAD
Issue Resolution

XtremeSpectrum

- **Worst case scenario is outdoor 30m UWB 200m from NEXRAD**
  - NTIA SP 01-43 Figure 4-4 indicates 19 dB additional isolation required
- **In order for the UWB device to be at 30m it must be in a building**
  - Mast & pole mounting are prohibited by the XtremeSpectrum proposal
  - However, margin for in-building losses not applied in this analysis
- **NEXRAD is a spot beam radar that must be blocked by the building**
- **Must blank or elevate the radar to operate (UWB not a factor)**
  - Clearing a 30m building at 200m requires 1.5º degrees elevation (5m) for 19dB
- **If the NEXRAD is not blanked or elevated the building is subject to excessive RF fields**
  - Field would be 2600 V/m !!
  - Exceeds safety standards for automobiles, airplanes, electronic devices, medical devices etc.

Air Route Surveillance Radar (ARSR)—What It Is

XtremeSpectrum

- **Measures enroute aircraft range and azimuth**
  - 200 nm (370 km) for a 2.2 m^2 (3.4 dBm^2) RCS airplane in clear air
- **Specifications**
  - ** Doppler processing gain of 9dB **
  - Antenna
    - Maximum gain 41.8dBi
  - Nine vertically stacked beams with different gains
  - Beam-One 3 dB Beamwidth Vertical 2.0, Horizontal 1.4 Degrees
  - Peak EIRP 1.4 GW

ARSR-4
Issue Identification

XtremeSpectrum

- **NTIA SP 01-43 no issues for 2m in/outdoor UWB at Class B –34dB**
  - The XtremeSpectrum proposal evaluated at NTIA SP 01-43 Figure 4-8
    - No margin for building losses applied
- **NTIA SP 01-43 no issues for 30m indoor UWB at Class B –34dB**
  - The XtremeSpectrum proposal evaluated at NTIA SP 01-43 Figure 4-8
- **Potential issue for 30m outdoor UWB at Class B –34dB**
  - Issue resolution on next page

	NTIA 01-43 Margin from Class B UWB (separation)	XS Proposed –34 dB UWB [outdoor] (separation)	–34 dB UWB and 9 dB isolation [indoor] Or 9 dB Doppler Proc. Gain (separation)
ARSR-4 (2 m UWB)	-20dB (6.1 km)	+14 dB (Not required)	+23 dB (Not required)
ARSR-4 (30 m UWB)	-39 dB (>15 km)	-5 dB (~400 m)	+4 dB (Not required)

ARSR-4
Issue Resolution

XtremeSpectrum

- **Consider 30m outdoor UWB at Class B –34 dB**
  - NTIA SP 01-43 Figure 4-8 indicates 5 dB additional isolation needed
- **The low beam of the low bank of the ARSR-4 is blocked by the building**
  - Since the low beam is blocked the UWB is not a factor to it
  - Other beams of the ARSR-4 do not see the building so the UWB is no factor
- **Other scenario solutions available to NTIA & FCC include …**
- **Include the 9 dB Doppler processing gain of the radar in the analysis**
  - Doppler processing improves interference to noise ratio by 9 dB, provides the margin
- **Prohibit mast & pole mountings as proposed by XtremeSpectrum**
  - Then in order for the UWB device to be at 30m it must be in a building
  - In building propagation loss provides sufficient margin
- **ARSR-4 is typically located in remote areas**
  - At 200m a 30m building would be subject to unsafe RF fields in excess of 2000 V/m
    - Exceeds safety standards for airplanes, automobiles, electronic & medical devices
- **Reduce the UWB level—XS will support this if needed ☹**

Airport Surveillance Radar (ASR-9)—What It Is

XtremeSpectrum

- **Monitor aircraft in the airspace “in and around” airports**
- **Radar Parameters**
  - ***** Doppler processing gain of 9dB *****
  - 2.7-2.9 GHz,
  - Dual 1.3 Megawatt Transmitters
  - 33.5 dBi Gain Antenna
  - Max Range 110 km.
  - 4 dB NF+2 dB losses,
  - 4 MHz bandwidth (–104 dBm Receiver Noise Floor)
  - Pulse Width 1.08 µs & PRF dithered from 928 up to 1321 pulses/sec

ASR-9
Issue Identification

XtremeSpectrum

- **NTIA SP 01-43 no issues for 2m UWB at Class B –16dB**
  - XtremeSpectrum proposal evaluated at NTIA SP 01-43 Fig 4-11
    - No margin for building loss applied
- **NTIA SP 01-43 no issues for 30m indoor UWB at Class B –16 dB**
  - XtremeSpectrum proposal evaluated at NTIA SP 01-43 Figure 4-12
- **Potential issue for 30m outdoor UWB at Class B –16 dB**
  - Issue resolution on next page

	NTIA 01-43 Margin from Class B UWB (separation)	XS Proposed –16 dB UWB [outdoor] (separation)	–16 dB UWB and 9 dB isolation [indoor] Or 9 dB Doppler proc gain (separation)
ASR-9 (2 m UWB)	-5 dB (1.1 km)	+11 dB (Not required)	+20 dB (Not required)
ASR-9 (30 m UWB)	-25 dB (>1.5 km)	-9 dB (~400 m)	0 dB (Not required)

ASR-9
Issue Resolution

XtremeSpectrum

- **Worst case scenario is UWB at 30m high and 200m away from ASR-9**
  - NTIA SP 01-43 Figure 4-12 indicates 9 dB isolation required beyond the 16dB below Class B in the XtremeSpectrum proposal
- **Solutions available to NTIA & FCC include …**
- **Include the 9 dB Doppler processing gain of the radar in the analysis**
  - Doppler processing improves interference to noise ratio by 9 dB, provides the margin
- **Prohibit mast & pole mountings as proposed by XtremeSpectrum**
  - Then in order for the UWB device to be at 30m it must be in a building
  - In building propagation loss provides sufficient margin
- **The ASR-9 both illuminates the building and is blocked by it**
  - At 200m the building is subject to unsafe RF fields in excess of 1500 V/m
    - Risk to airplanes, automobiles, electronic & medical devices
  - Keep buildings and UWB 330m (computed value), or more, away from ASR-9
- **Reduce the UWB level—XS will support this if needed ☹**

Maritime Radar What It Is

XtremeSpectrum

- **Prevent ships from hitting shorelines or each other**
- **Typical System (Furuno S-band Marine Radar)**
  - 60 kW peak power into antenna
  - 27dBi Gain Antenna

    } **30 MW EIRP**
    - Narrow beam width (1.9°)
    - Azimuth sidelobes are at least 30 dB down (1000 times smaller than main lobe) beyond 10 degrees off the main lobe.
  - 3.05 GHz
  - 20m Height
  - 4 dB NF+2dB losses,
  - 4 MHz bandwidth (–104 dBm Receiver Noise Floor)
  - Pulse Width
    - 1.2µs for > 5km
    - 0.4µs for < 5km
- **A Robust Radar**
  - Spec'd to 160 km even though the radar horizon is less than 50 km

Maritime Radar
NTIA Criteria Satisfied

XtremeSpectrum

- **NTIA SP 01-43 no issues for 2m UWB at Class B –16 dB**
  - The XS proposal evaluated at NTIA SP 01-43 (pg 4-63, Table 4-53)
    - No margin for building losses applied
- **NTIA SP 01-43 no issues for 30m UWB at Class B –16 dB**
  - The XS proposal evaluated at NTIA SP 01-43 (pg 4-64, Table 4-55)
    - No margin for building losses applied
- **No issues with UWB devices on the decks of cruise ships**
  - The deck is below the radar and in its nearfield
    - The beam has not formed

Search and Rescue Satellite (SARSAT)—NTIA Criteria Satisfied

XtremeSpectrum

- **XS proposal is Class B –34dB in SARSAT**
  - No building losses applied in this analysis
- **NTIA SP 01-43 indicates no issues for 2m high UWB**
  - NTIA SP 01-43 (pg 4-31, Table 4-38a) adjusted to XS UWB levels
- **NTIA SP 01-43 indicates no issues for 30m high UWB**
  - NTIA SP 01-43 (pg 4-33, Table 4-40a) adjusted to XS UWB levels

	NTIA 01-43 Margin from Class B UWB (separation)	XS Proposed –34 dB UWB (separation)	–34 dB UWB and 9 dB building isolation (separation)
SARSAT (2 m UWB)	-27.7 dB (3.1 km)	+6.3 dB (Not required)	+15.3 dB (Not required)
SARSAT (30 m UWB)	-24.7 dB (6.1 km)	+9.3 dB (Not required)	+18.3 dB (Not required)

XtremeSpectrum

GPS, Assisted GPS and Aggregation

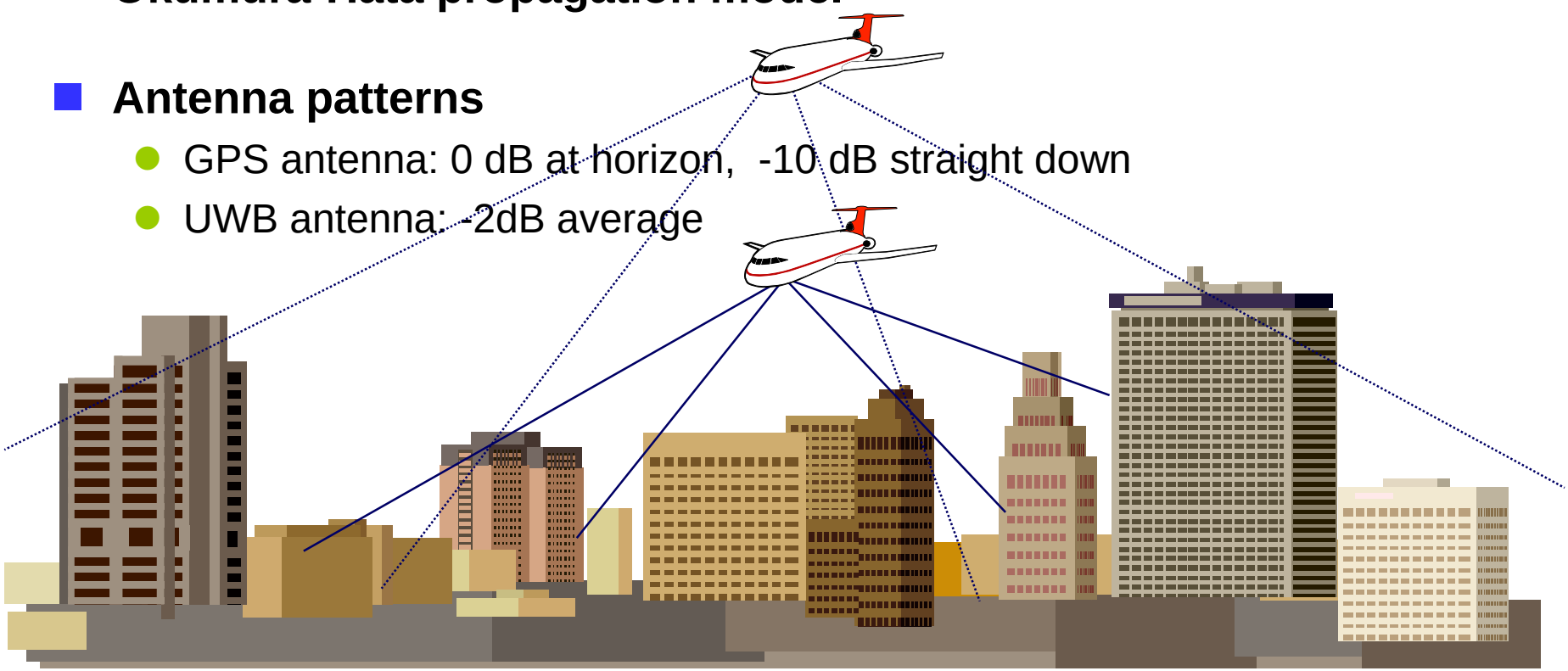
GPS—All Proposed Federal and Industry Protection Criteria Met

XtremeSpectrum

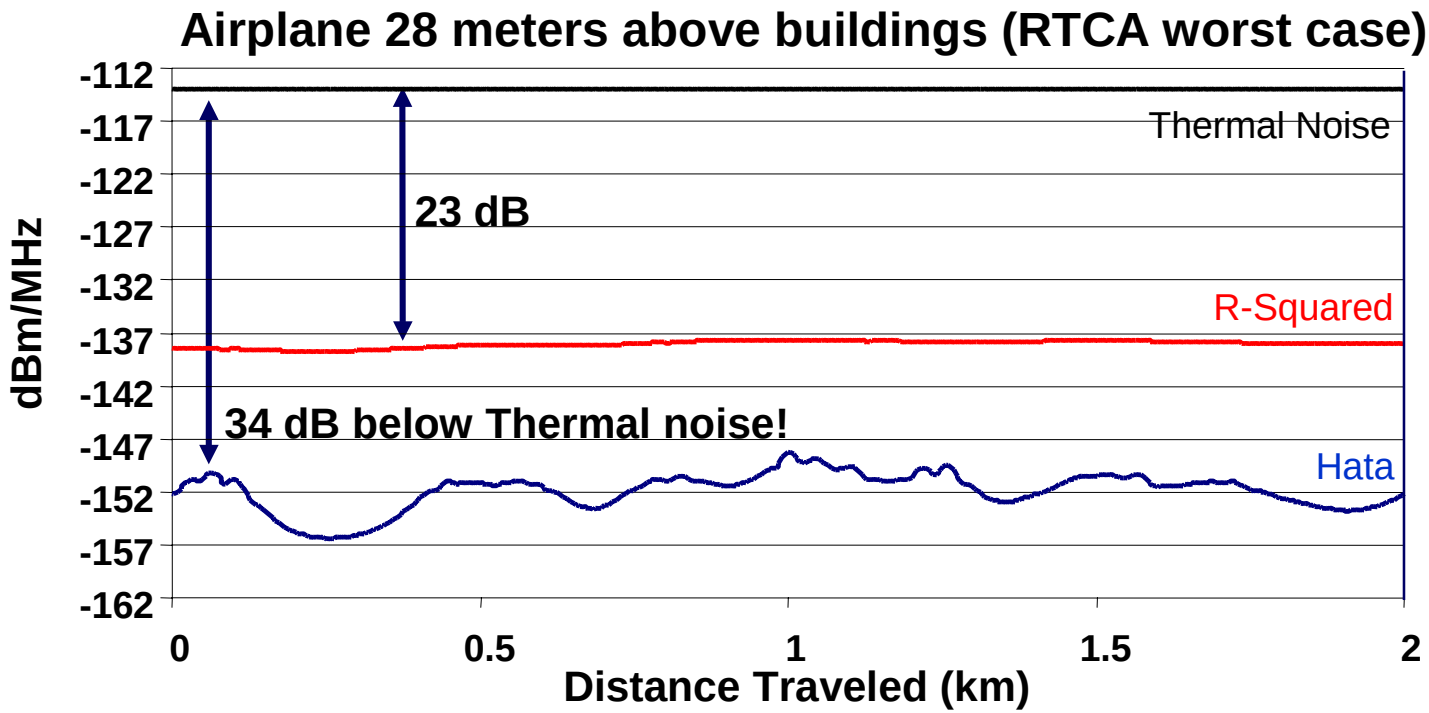
- **Analyzed with XS proposal of 34dB below Class B for GPS**
  - Limits UWB in GPS bands to levels requested by GPSIC. Exceeds RTCA and all other GPS advocates in all other FCC proceedings
- **Low flight over heavy concentration of UWB transmitters**
- **Precision approach near hi-rise with UWB transmitters**
- **High flight over heavy concentration of UWB transmitters**
- **Assisted GPS**
- **Aggregation effects are insignificant**
  - No impact on safety criteria
  - Yes, signal power adds but signal strength falls much faster

City Over-Flight Scenarios

- **As height goes down**
  - Blockage by buildings tends to reduce the signal, but
  - The shorter path tends to increase the signal
- **Okumura-Hata propagation model**
- **Antenna patterns**
  - GPS antenna: 0 dB at horizon, -10 dB straight down
  - UWB antenna: -2dB average

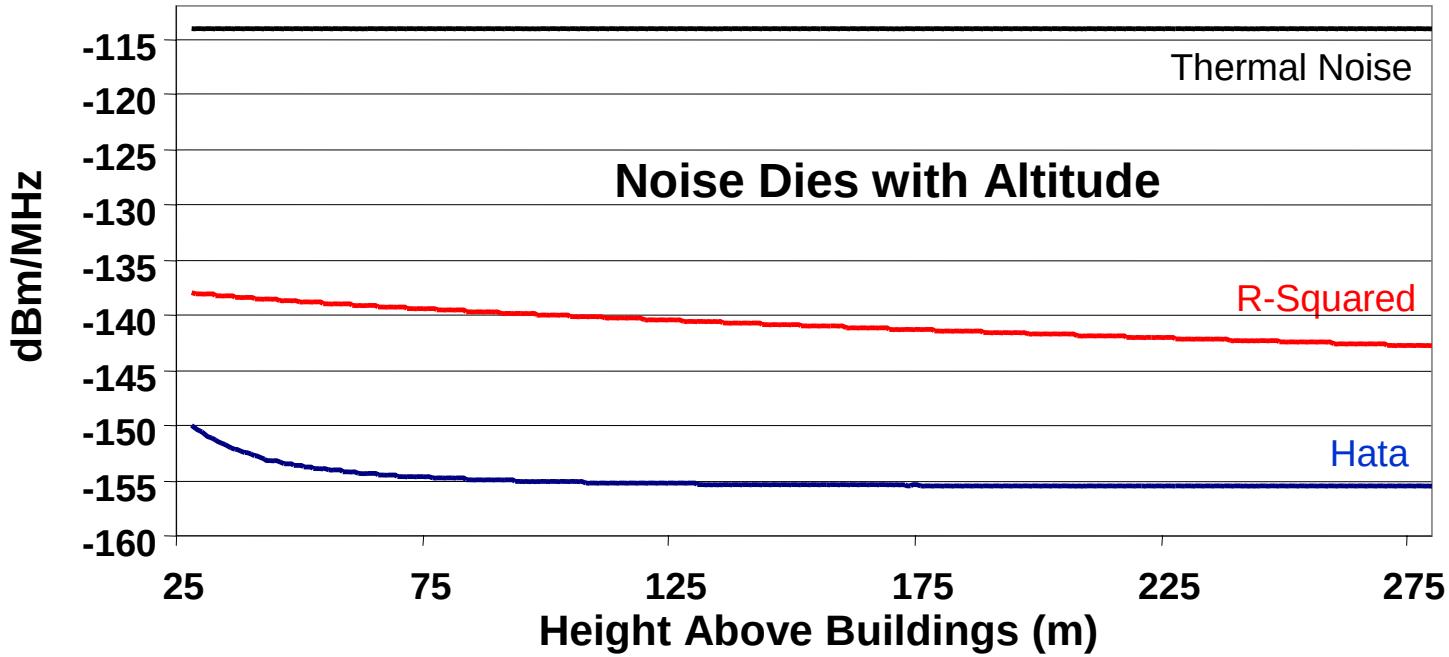


Low Altitude Airborne GPS Safety Criteria Satisfied



- **City with 200 UWB devices per sq. km—aggregation is insignificant**
  - Emitter density from NTIA report
  - All devices transmitting simultaneously
  - All devices outside, no building attenuation
  - Plane passes over highest elevation UWB
- **Margin greater than 30dB**

High Altitude Airborne GPS Safety Criteria Satisfied

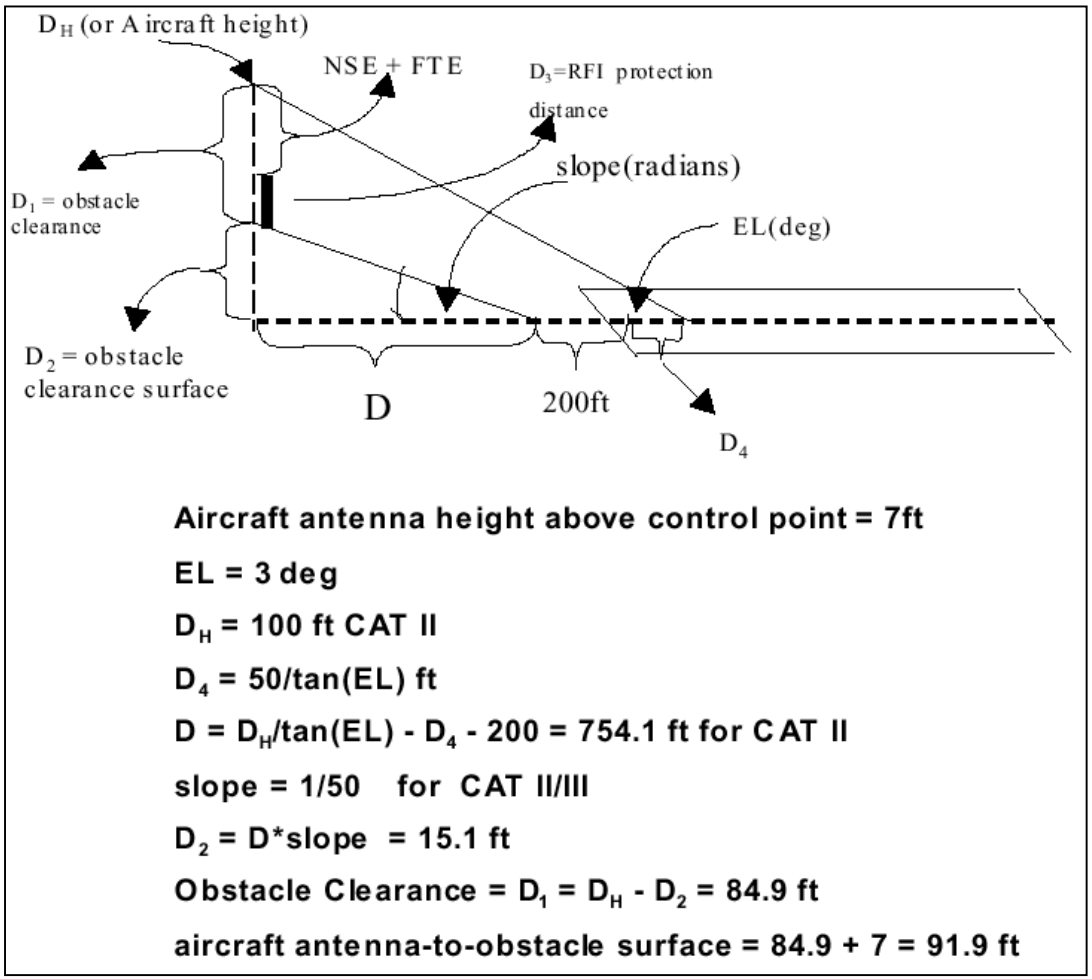


- **City with 200 UWB devices per sq. km —aggregation is insignificant**
  - Emitter density from NTIA report
  - All devices transmitting simultaneously
  - All devices outside, no building attenuation
  - Plane directly over highest elevation UWB
- **Margin greater than 30 dB and increases with altitude**

Precision Approach GPS Safety Criteria Satisfied

XtremeSpectrum

RTCA analysis of category II precision approach



- **RTCA study**
  - Outdoor Study
  - Worst case UWB position near runway
  - Had multiple UWBs
    - 10 equidistant emitters
  - Had Spectral Lines
  - Ultra Conservative
    - Extra 10 dB margin
- **Answer was**
  – 18.7 dB from Part 15
  – 28.7 dB for lines
- **Proposal is for – 34 dB**

Assisted GPS

XtremeSpectrum

- **Assisted-GPS units obtain 20 to 30 dB of additional processing gain over and above a standard GPS C/A code receiver.**
- **Key point is that the additional processing (i.e. longer integration times) is equivalent to a narrower filter bandwidth**
  - It passes the GPS signals and rejects noise (or anything that does not look like the desired GPS signal)
- **The UWB signal is suppressed along with everything else**
- **An assisted-GPS unit is no more sensitive to UWB interference than a normal GPS unit.**
  - i.e. The noise floor of the A-GPS unit may drop from –130 dBm to –150 dBm, but the effective bandwidth is 100 times smaller so 20 dB less UWB noise can get in.
  - A UWB transmitter does not need to drop its power by 20 dB

In-building Aggregation Is Insignificant

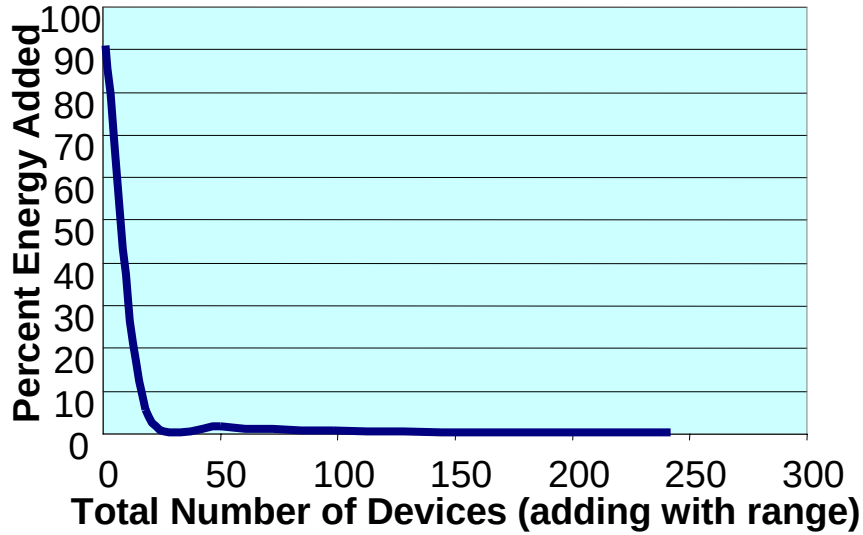
XtremeSpectrum

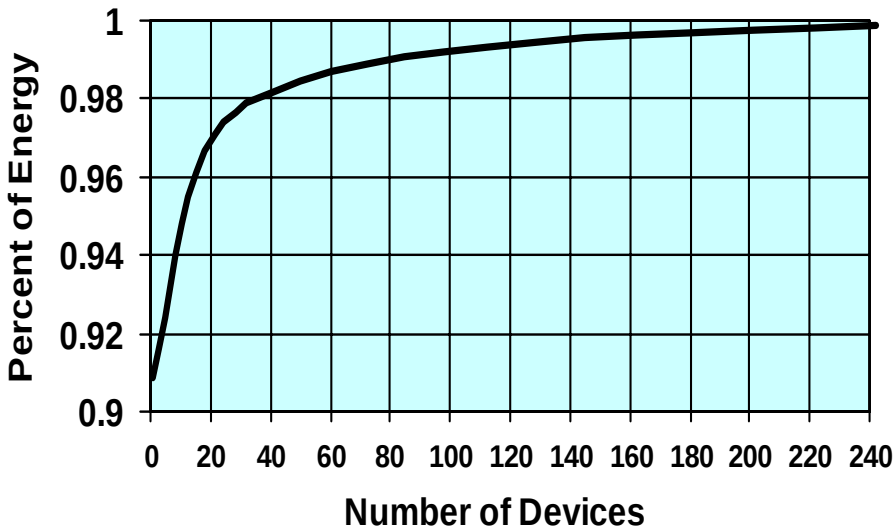
WPAN #	Range to Victim Receiver m	Power received by Victim Receiver picowatt/MHz	% of total energy received by victim receiver	Accumulated Power Received By Victim Receiver	Location of WPANs
1	3	0.029506	90.957	0.029506	Net in same room
2-18	7	0.001880	5.796	0.031386	17 Nets, 8 in adjacent rooms (left, right, above, below, left-above, right-above, left-below, right-below) PLUS 9 across the hall
19-50	11	0.000580	1.789	0.031966	32 Nets 16 in 2nd adjacent Rooms + 16 across hall
51-98	15	0.000252	0.776	0.032218	48 Nets, 24 in 3rd adjacet rooms + 24 across hall
99-162	19	0.000130	0.402	0.032348	64 Nets 32 in 4th adjacent rooms + 32 across hall
163-242	22	0.000091	0.280	0.032439	80 Nets 40 in 5th adjacent rooms + 40 across hall
Total Interference = .032439 picowatts/MHz = -104.9 dBm/MHz =1.099 times the power from the closest emitter					

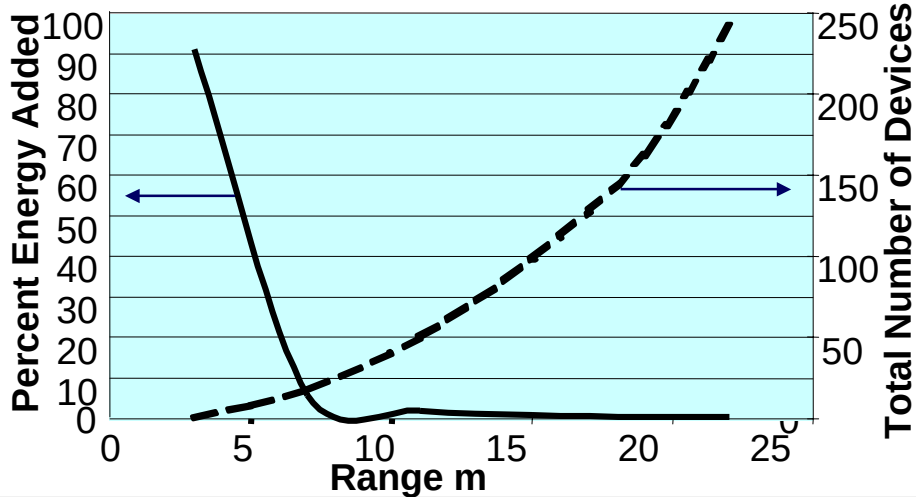
- **By 4th ring, there are 64 simultaneous transmitters added at equal distance, yet together they produce less the 1/2 percent of the total interference power**
- **The tiny received noise does not increase without bound**
- **The more distant WPANs become insignificant**
- **<u>i.e. In-building aggregation is insignificant</u>**

Plot of Previous Slide

- Yes, Power adds Linearly
- But…
  as the number of devices grows, ***the energy added becomes insignificant***
- i.e. Aggregation effect is immaterial







UWB in Airliner First Class Cabin

Special Case Analysis For Accidental Peer-to-Peer UWB In the First Class Cabin of an Airliner

No Harmful Interference to Any System Analyzed in NTIA SP 01-43

- **DME Interrogator**
- **ATCRBS Transponder**
- **CW Altimeter**
- **Pulsed Altimeter**
- **GPS**

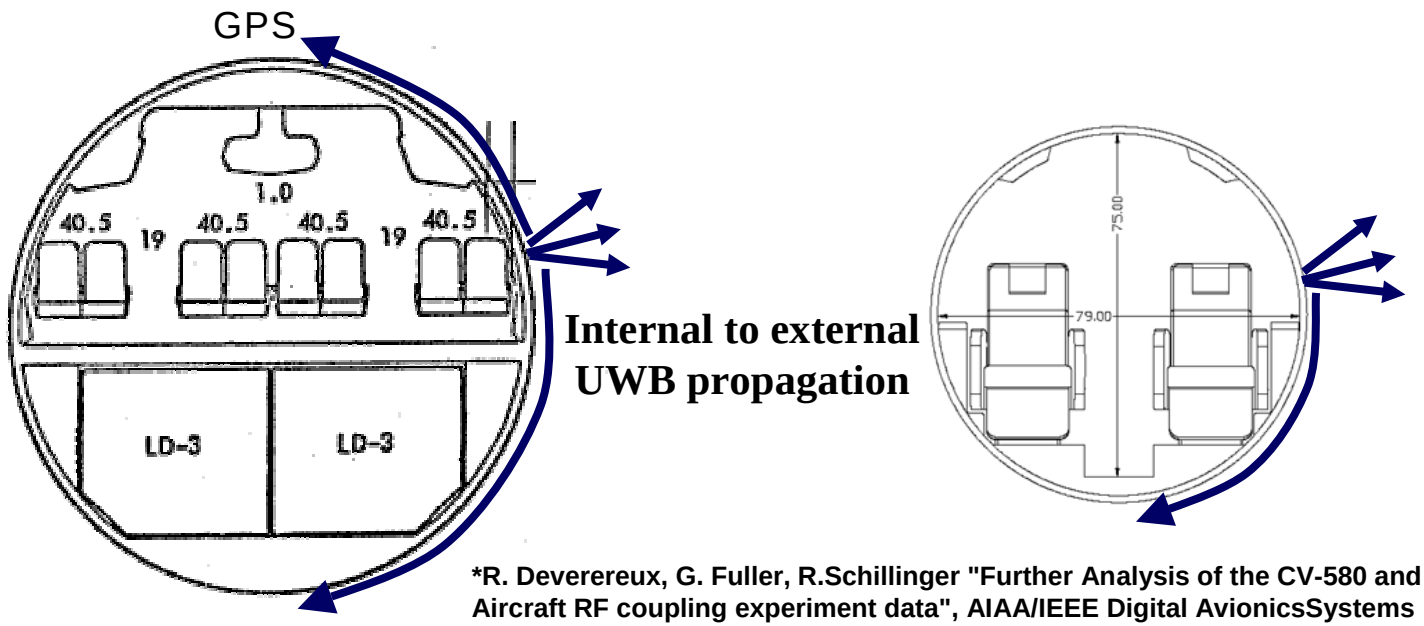
Accidental First Class Cabin Use Under XtremeSpectrum's Proposal

XtremeSpectrum

- **Consistent with existing policy electronic devices should be switched off during taxi, takeoff, approach & landing**
  - Usage should be accidental
- **XtremeSpectrum proposed rules eliminate accidental use**
  - Peer-to-Peer handheld operation requires affirmative initiation
    - Turning on the device is not enough, user must initiate communication
- **Nevertheless, analysis assumes UWB device transmits 100% of the time**

First Class Cabin Analysis Methodology

- **Assumed free space propagation**
  - Very conservative because more than 40dB isolation
    - Measured isolation of 51 dB at GPS, 40-45 dB typical from 109 MHz to GPS*
    - Coupling to outside of fuselage is through windows and around metal exterior
- **Evaluated XtremeSpectrum proposal by NTIA SP 01-43 and SP 01-45**



*R. Devereux, G. Fuller, R.Schillinger "Further Analysis of the CV-580 and B-727 Aircraft RF coupling experiment data", AIAA/IEEE Digital AvionicsSystems Conference 1997 pp. 4.1-1-8

All Safety Criteria Satisfied for Accidental UWB in Airplanes

XtremeSpectrum

- **No interference for airborne UWB into aviation receivers based on extension of NTIA results for UWB on ground**

	NTIA 01-43/01-45 Margin from Class B UWB	XS Proposed Mask	Separation range for UWB in freespace
DME Interrogator NTIA 01-43 Table 1	-5.7 dB margin or Class B at 90 m	34 dB	1.8 m
ATCRBS Transponder NTIA 01-43 Table 1	-3 dB margin or Class B at 20 m	34 dB	0.4 m
GPS NTIA 01-45 Table 4	-27.3 dB for noise -like UWB at 2 m	34 dB	0.9 m
CW Altimeter NTIA 01-43 Table 4-16	66.5 dB for UWB at 760 m range	0 dB	0.36 m
Pulsed Altimeter NTIA 01-43 Table 4-16	56.2 dB for UWB At 1522 m range	0 dB	2.3 m

Proceeding Should Address Footnote US 246

XtremeSpectrum

- **US246 - …, no stations shall be authorized to transmit in the following bands:**
  - 608 - 614 MHz*
  - 1400 - 1427 MHz*
  - 1660.5 - 1668.4 MHz*
  - 2690 - 2700 MHz*
  - 4990 - 5000 MHz ##
  - 10.68 - 10.70 GHz ##
  - 15.35 - 15.4 GHz ##
  - 23.6 – 24.0 GHz*
- **Rules should allow UWB in bands marked ##**
- **Bands marked * are considered out-of-band**